



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

THE FAITH OF THE SCIENTIST

ARTHUR HOLMES, PH.D.

Dean of the Faculty, The Pennsylvania State College

One of the most hopeful signs of the time is the interest of scientists in religious matters. The old antagonism between scientist and theologian continues, but it is largely due to mutual misunderstanding. There is a theology growing up that is thoroughly scientific, and, as this article shows, there is a scientific attitude which is really sensitive to religion. This growing reconciliation lies both in method and in content of thought. Any theology that is unsympathetic to the procedure and discoveries of science is doomed to become an obscurantism which will breed irreligion among thoughtful persons.

Science and faith appear to be inherently, essentially, and irreconcilably antagonistic. Science knows, faith believes; science predicts, faith hopes; science seeks bare truth and follows it to the bitter end, faith robes its truth in human longings and follows where the heart leads; science lays its foundation of incontrovertible facts and builds thereon its superstructure of immutable laws, faith lifts up its hands into the infinite void and holds its ideals before the eyes of faltering men. Such are some of the opinions of the antagonisms between these two great kingdoms of human experience, and such oppositions have made many men inquire if faith is possible in this age of ascendant science. "Are we not compelled," say they, "to consider it almost criminal to believe in the absence of evidence convincing to the sense or reason, holding, like Huxley, till such evidence arrives, to an invincible agnosticism?" For answer, let us examine briefly the structure of modern science to see if it may not contain some stones of faith either in its superstructure or in its foundations.

The construction of science to be considered here is simple enough. It is made up of facts, hypotheses, and well-accepted theories called variously scientific truths, natural laws, or laws of nature. We will not stop to consider the facts, though the element of faith contained in each and every one of them might be surprisingly large. As for hypotheses, science itself frankly admits that they are mere beliefs awaiting further verification. They are the antennae of science feeling its way out into the darkness of the unexplored. Thus they make faith an organ of knowledge; and, since so many hypotheses, because they direct research, are eventually verified, they direct science along certain channels. So, in its preliminary stages, a science may most unconsciously be predetermined in its theories by faith and not by knowledge. When hypotheses have been proved they become theories, scientific truths, and natural laws. These represent the completed products of science, its body of truth by which it swears its great oaths of certainty.

There are several characteristics of these laws. First, they are based upon observation through the senses and ought not to contain any truths not so observed; secondly, since they are the results of a limited number of observations and cannot with certainty apply to the future, they are always probable, or only "practically certain," i.e., believed in because it is expedient to believe in them; thirdly, they are descriptions only, not explanations giving the causes or purposes of actions; fourthly, they are the briefest possible descriptions; fifthly, they are the simplest descriptions aiming to involve only one term, motion. We will briefly examine these attributes to see if any, and how much, faith may be lodged in them.

First, though science bravely endeavors to base its theories upon observed facts alone, it is unable to stick absolutely to that method. It must go beyond what the eye actually sees, first, to the use of factors not yet seen and possibly never to be seen, like molecules, atoms, electrons, etc., and, secondly, by reason of conditions imposed by science upon itself, to factors which never by any stretch of imagination can be perceived. These, surprising as it may be to the layman, are surfaces, lines, points, lengths, breadths, thicknesses, causes, etc. A length, in science, is always an average of measurements. The "true" length of a table, for example, can never be known, and such ignorance "is essential to any image of Nature that science can evolve." The ignorance is not serious, as it is covered by a grain of faith; but my point is that the pure grain of faith is there. Karl Pearson, who assumes and attempts to maintain the

Humian point of view in science, insists that "conceptions and ideas, pure products of the mind, must be formed" before a law emerges, and definitely states "a point, valid as a conception, can never have a real existence as a perception." The geometrician freely admits the impossibility of his points and lines and the physicist by no means assumes "the existence of atoms and molecules as possible perceptions." So the surveyor and the physicist both admit their element of faith in drawing their pictures of the world.

The second attribute, the uncertainty due to the fact that induction always rests upon partial observation, is so obvious that it is freely admitted by all scientists. Again, however, let me say that the faith of science in the future, though pure faith, has been justified. Given three points in a comet's orbit, let mathematics set the date, and we can trust the construction of the universe to keep the appointment, not just exactly to the thousandth of a second, but near enough to keep our patience from spoiling.

Thirdly, since laws are descriptions only they do not "explain" in the sense of giving either causes or ends of actions. They merely say that such and such lines are or will be the paths of bodies; that the bodies themselves are or will be at such and such a place at a certain time. *What* the bodies really are, or *why* they will be there, is left for metaphysics and religion to explain. Gravity is not assumed to pull stones, apples, balls, rain, etc., to the earth, but "gravity" is the name for that element of behavior similar in all falling bodies. All of them, under certain conditions,

hurry up in their flight to the earth, and the "hurry-up" or acceleration is measured and written out in a brief shorthand language called algebra, and that is gravity or gravitation. A quotation or two from Karl Pearson will make this conception clear. He says in his *Grammar of Science*:

"We are accustomed to speak of scientific law, or at any rate of one form of it, termed 'natural law,' as something universally valid," and adds that some assert that that law "has a validity quite independent of the human minds which formulate, demonstrate, or accept it." Does it have such independent existence or not? Did gravitation guide the planets before Newton came, and did he happily light upon this hitherto unknown force as a discoverer upon a new continent? Pearson replies:

The law of gravitation is not so much the discovery by Newton of a rule guiding the motion of planets as his invention of a method of briefly describing the sequence of sense-impressions which we call planetary motion. . . . The statement of his discovery was not so much the discovery as the *creation* of the law of gravitation. . . . There is more meaning in the statement that man gives laws to Nature than in its converse that Nature gives laws to man.

The first result for us to gain is then the truth that natural law, far from being an ironclad necessity of implacable "nature," is a product of man's "creative imagination."

If natural laws are made by men, why then do men accept such laws as true and righteous altogether? The consideration of the fourth and fifth points will show just what this "truth" is and reveal how much science is im-

penetrated with faith even in its most vital parts. For the final test is not certainty, as is shown by the rejection of one theory when two theories will equally and adequately cover all the facts in a given phenomenon. There are many illustrations of such situations in the history of science, but probably the most illuminating one is the substitution of the Copernican theory of describing the planetary motions for the nearly fifteen-hundred-year-old Ptolemaic theory. Everybody now accepts it as a truth beyond question that the earth moves and the sun stands still. For that faith he would, in the fourteenth century, have been burned to death as Galileo nearly was. A complete reversal has been made since then. Nobody now dares to say that the sun moves. Nevertheless, as Mach and others have pointed out, the old system which made the sun move, and which Huxley later declared was "utterly at variance with fact," was just as true as its successful rival, the Copernican system. Both fitted the facts; both were equally true. Yet *without the discovery at that time of a single new fact bearing on the situation* the new system overturned the other, hoary with age and venerated for its verity. Why? Because, as Mach, Singer, Pearson, Rice, and others have recently made evident, the Copernican system was simpler. This factor, decisive here on such a grand scale, is present in every acceptance of a scientific theory, from the greatest to the smallest.

Lest we seem to settle so critical a point by only one example let us turn to mathematics. Surely geometry is "true" past dispute. Upon it are

grounded nearly all mathematics and nearly all science. Yet Dr. Stecker writes:

In brief, mathematicians have long since learned that there are several systems of geometry, each consistent with all the facts of experience. Euclid's is the simplest of these systems, and we use it because it is the simplest, and for no other reason. Which of these systems is the true geometry of our space we cannot, in the nature of things, know.

We accept, then, *simple* descriptions of nature as the truth about nature. But do we *know* that nature is simple? Poincaré, the greatest mathematician of our day, answers:

Let us first of all observe that every generalization supposes in a certain measure a belief in the unity and simplicity of Nature. As far as the unity is concerned, there can be no difficulty. . . . As for the second point, that is not so clear. It is not certain that Nature is simple. Can we without danger act as if she were? . . . Here, then, are two opposing tendencies, each of which seems to triumph in turn. Which will win? If the first wins, science is possible; but nothing proves this a priori. . . . In fact, we can give this question no answer.

Here, then, is an explicit statement by a most powerful thinker upon the foundations of all science, proclaiming that faith in an unknown and unproved attribute of nature is a controlling and guiding ideal in the building of the magnificent structure of science. Far from hinting that such faith invalidates, or even deteriorates, the conclusions of science, I am trying only to show that faith has functioned most beneficially in a field where its very success has

obscured its existence. Though science cannot be absolutely certain of any law, physicists will continue their good work, chemists will compound healing drugs, and astronomers will fix our calendars. Only Darius Greens will jump from roofs to test flying-machines, and only faithless Peters will attempt to walk on water. The rest of us, though it is a mere matter of faith, will insist upon fearing that we may fall or sink.

Finally, lest it be thought that the faith of the scientist is of a genus utterly unlike the faith of a religionist, let me recall that Christian faith comes by hearing (Rom. 10:17), is the proving of things not seen, leads to an assurance of things hoped for (Heb. 11:1), and has its element of desire (Gal. 5:6), even as science has its "desire for maximum unity that we struggle to satisfy and the gratification of which constitutes the truth of an interpretation." To show further that this similarity is also recognized by some scientists, let me add the words of Professor Jacoby, the astronomer:

Therefore, is it possible for science, like religion, to believe something not logically proven? . . . Science today has attained only to the portal of knowledge; when her forces shall have stormed the citadel, when she shall stand upon the deepest foundation stone of truth attainable by man, she will find, surely, that stone bedded upon some kind of faith, some belief outside the domain of rigid logic.

Modern science has achieved many and patent victories over the material world. It has contributed magnificently to the alleviation of the ills and to the increase of comforts among mankind. Yet I venture to say that none of its

more visible achievements have surpassed in significance the gradual growth of science into a clearer consciousness of its real nature, its real foundation, and its real ideals. Quite involuntarily, while it thought itself concerned only with external nature, it was being driven onward in its course by the constitution of the human mind struggling for a unity that must ever remain the controlling principle of both science and religion. This consciousness of oneness permits such sayings as those of Sir William Thompson:

"Let nobody be afraid of true freedom of thought. Let us be free in thought and criticism; but, with free-

dom, we are bound to come to the conclusion that science is not antagonistic to religion, but a help to it"; and of Joseph Henry, "The person who thinks there can be any real conflict between science and religion must be either very young in science or very ignorant in religion"; and the nobly worded creed of Sir Oliver Lodge, beginning, "I believe in one infinite and eternal Being, a guiding and loving Father in whom all things consist"; and the experience of Professor Meehan, "Scientific studies have strengthened my faith, strengthened it indeed to an extent that no study besides could have effected."

ISLAM, AN APPRECIATION

REV. GILBERT REID, D.D.

International Institute of China, Shanghai, China

Several months ago the BIBLICAL WORLD published an article by Dr. Reid on Buddhism. The present article is a companion treatment of another important religion. We shall never understand the real position of Christianity among the religions of the world until we appreciate these other religions. It is the merit of such articles as the following that they compel one to compare the best things in Christianity with the best rather than the worst things in the other religions.

It is worthy of reference that this discussion of Islam is under the auspices of the Billings Lectureship, representing the Unitarian body, which of all branches of Christianity is most in sympathy with the great teachings of the prophet Mohammed. The Unitarian and the Moslem are akin in cardinal religious doctrines. While neither a Moslem nor

a Unitarian, the speaker who enters on this study is convinced that every devoted Christian ought to be able, without any undue strain on his conscience, to see and express a hearty appreciation of this faith which includes Jesus as one of its chosen prophets.

It is now over thirty years since the speaker first formed the acquaintance